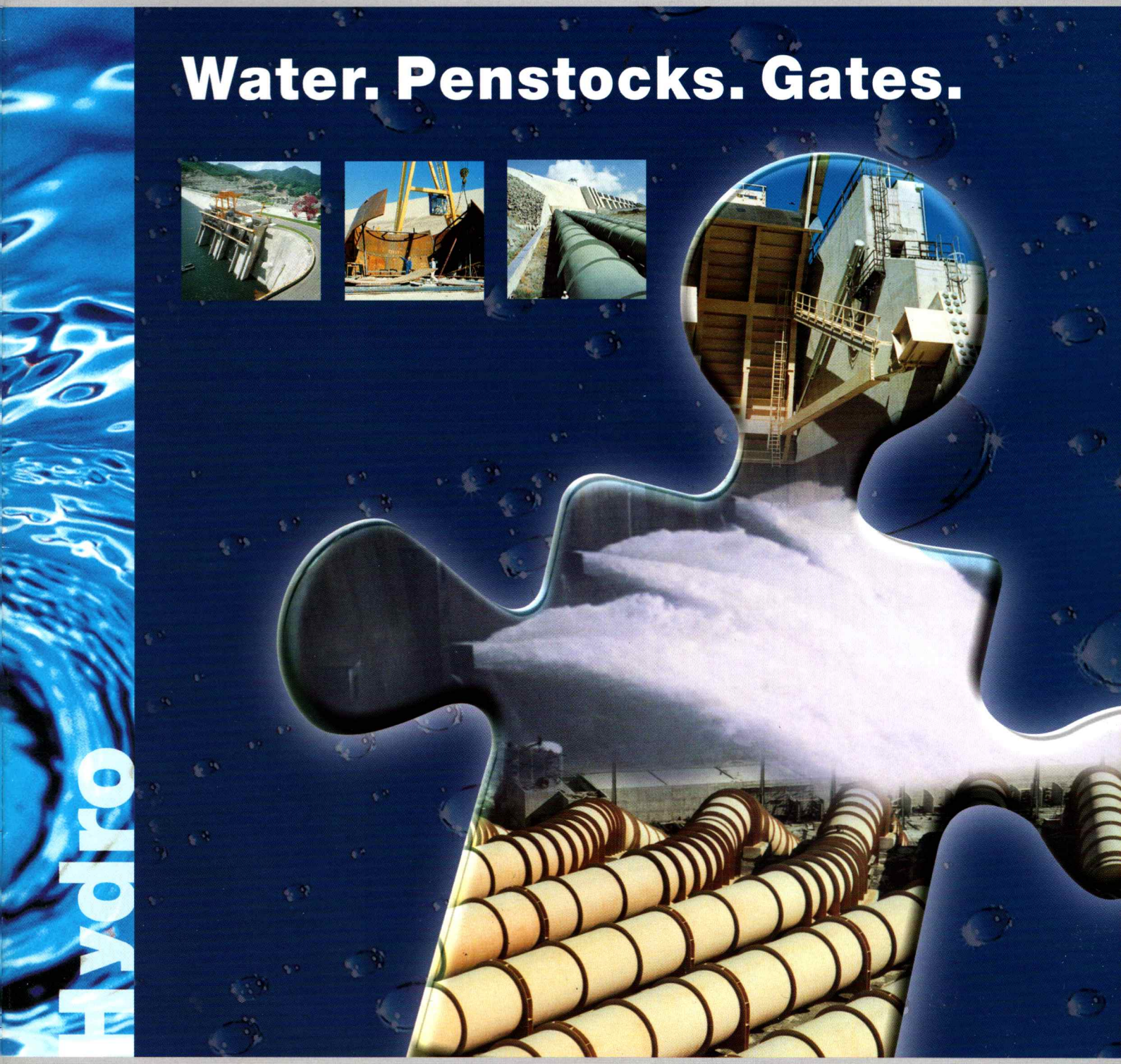
VA TECH

VA TECH HYDRO

PENSTOCKS & GATES



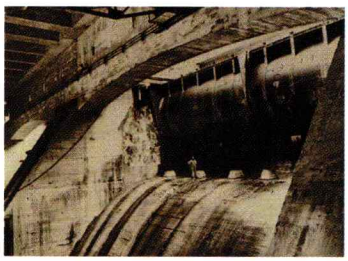
www.vatech-hydro.com

VOEST MCE ELIN SAT AUTOMATION

INNOVATION AND EXPERIENCE

Decades of experience and a spirit of innovation - a combination promising success

VA TECH HYDRO is, with regard to penstocks and gates, the legal successor of the former companies VOEST ALPINE / VA TECH VOEST MCE of Austria,



SULZER ESCHER WYSS/ SULZER HYDRO and ACMV / HYDRO VEVEY, both from Switzerland.
All the know-how and experience gained in decades by these companies is now available from one single source.

Within VA TECH HYDRO the center of competence for penstocks and gates is in its subsidiary in Linz, Austria, where the fabrication of these products was already launched in 1947.

To date, our international record lists some 770 hydropower plants worldwide equipped with penstocks and gates from VA TECH HYDRO.
Our design for hydraulic steel structures guarantees state-of-the-art technology and top quality. The world over, barrages, spillways, bottom outlets, intake structures and locks are built with our know-how and stand for save and reliable operation. Time and again we have also proved our competence in the design, fabrication and installation of penstocks. Our program in this field covers exposed penstocks, steel tunnel linings, bi-/trifurcators and manifold systems, pipe bridges. With regard to penstock fabrication at site, VA TECH HYDRO is by far market leader in this technology.

Permanent development to secure the technological lead has always been given top priority in VA TECH HYDRO. Needless to say, our products are subject to the most stringent international quality standards.

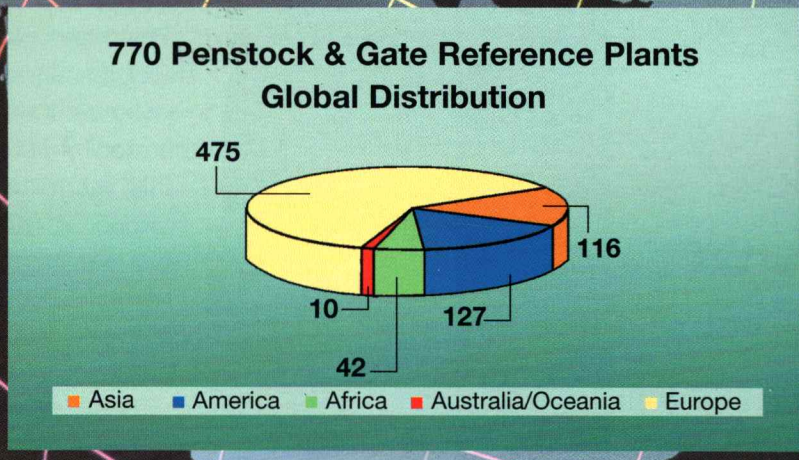
WORLDWIDE SUCCESS

In 79 countries, spread over all continents, hydro plants fitted with penstocks and gates by VA TECH HYDRO are working to full satisfaction

One of the principal demands in our business is being there: close to the market, close to our clients. In 25 overseas countries VA TECH HYDRO holds own subsidiaries and sales offices.

Assisting of customers and their engineers in the selection of optimized project configuration and project financing is one of our main tasks. Giving advice and elaborating cost budgets are part of our routine service, and are greatly appreciated by the customers.

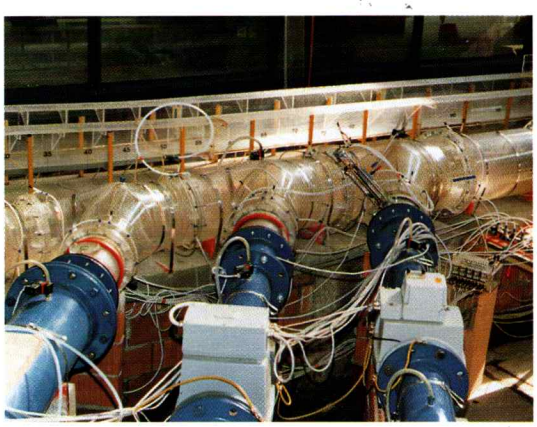
The today's development in the energy sector calls more and more for "Turnkey Contractors" and "Package" solutions.VA TECH HYDRO is among the very few companies who can offer the complete "Water to Wire" package, including penstocks, gates, water turbines, generators, transformers, transmission lines and the entire balance of plant.

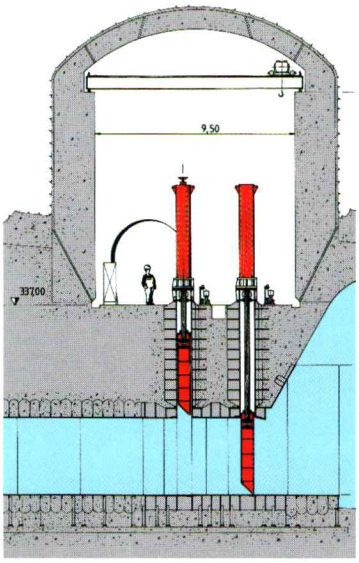


RESEARCH AS A DRIVING FORCE

Continuous investment in Research and Development lies at the basis of VA TECH HYDRO's internationally renowned technology

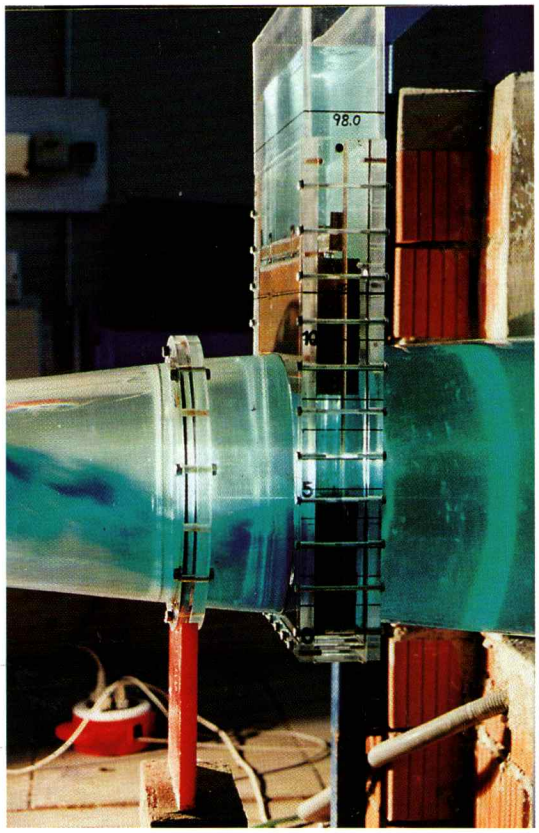
Hydraulic studies and model tests

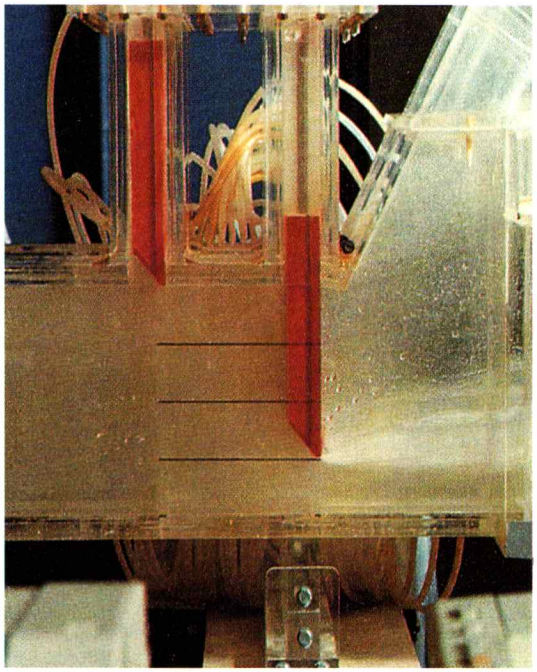




The main criterion for bifurcators is optimum flow behaviour. To achieve this, model tests are performed in our own research labs, but also often in cooperation with university institutes, to determine the optimum hydraulic shape, i.e. the one showing the least head losses.

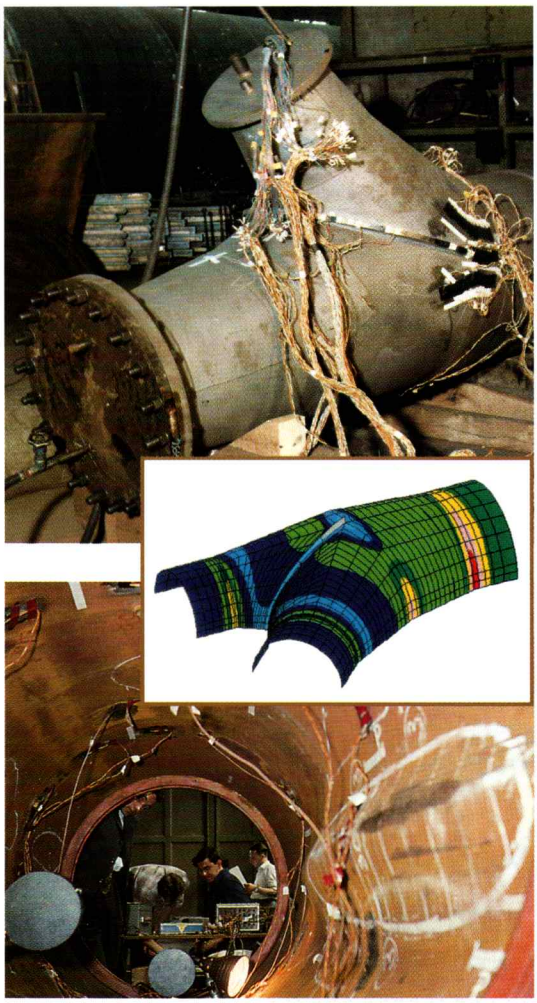
On the basis of numerous model studies for high-head gates and draft tube gates, new insights into their hydrodynamic behaviour could be gained, enabling our designers to enhance the operational safety of these structures accordingly.





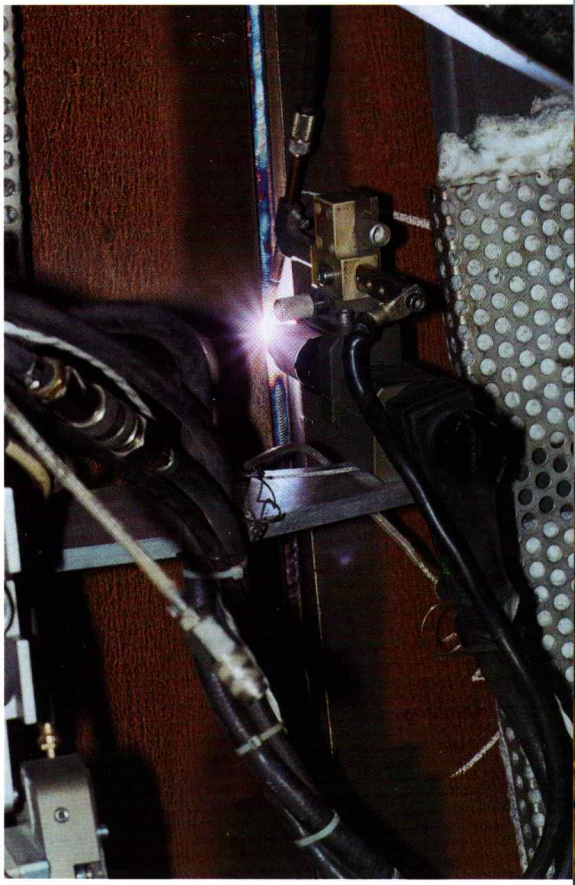
Beyond mere theory

For VA TECH HYDRO the verification of computational methods plays an important role. Thus, for example, the calculated stresses in complex geometrical



structures such as bifurcators are routinely checked by strain gauge measurements, on the prototype or on a model.
The measured data are then used to improve our stress analysis programs.
In another series of theoretical studies and model tests to verify the theory of critical buckling pressure of ring-stiffened pipes, we were able to achieve a major contribution to this aspect of science, which resulted into an improvement of components in terms of economy and safety.

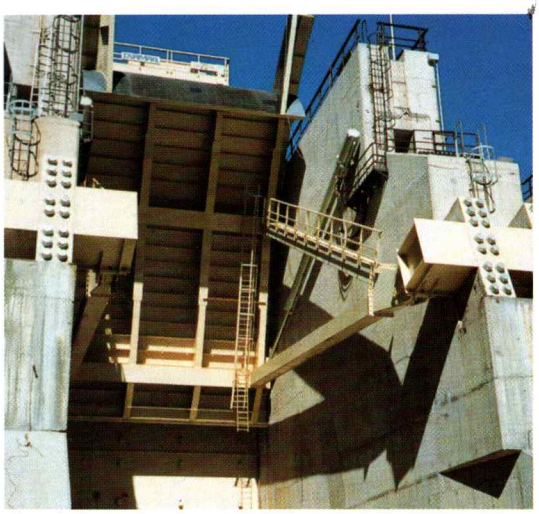
Optimized manufacturing technologies



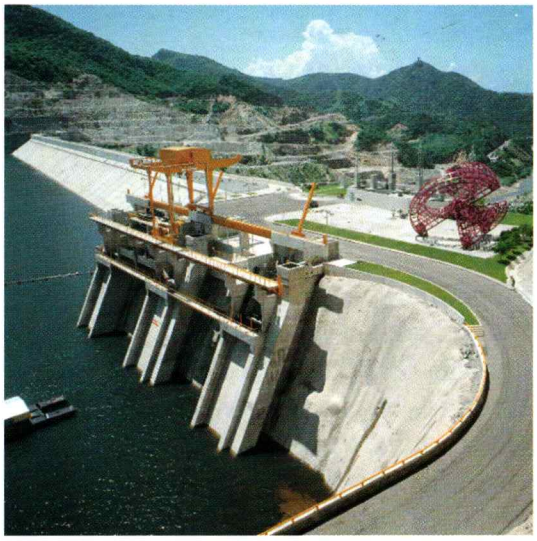
In penstock construction, the right welding technique is of particular importance.
The welding of steels having a yield point of up to 800 MPa poses no problem for VA TECH HYDRO, even under the most difficult conditions; the relevant technology was developed in the company's own welding laboratories.
VA TECH HYDRO is also able to offer an automated welding process for in-situ circumferential welds on penstocks; this process (TIG Hot Wire) has been specially adapted for this application by our engineers and it can be used for all material grades including Q&T steels.

SAFETY THAT FLOWS FROM EXPERIENCE

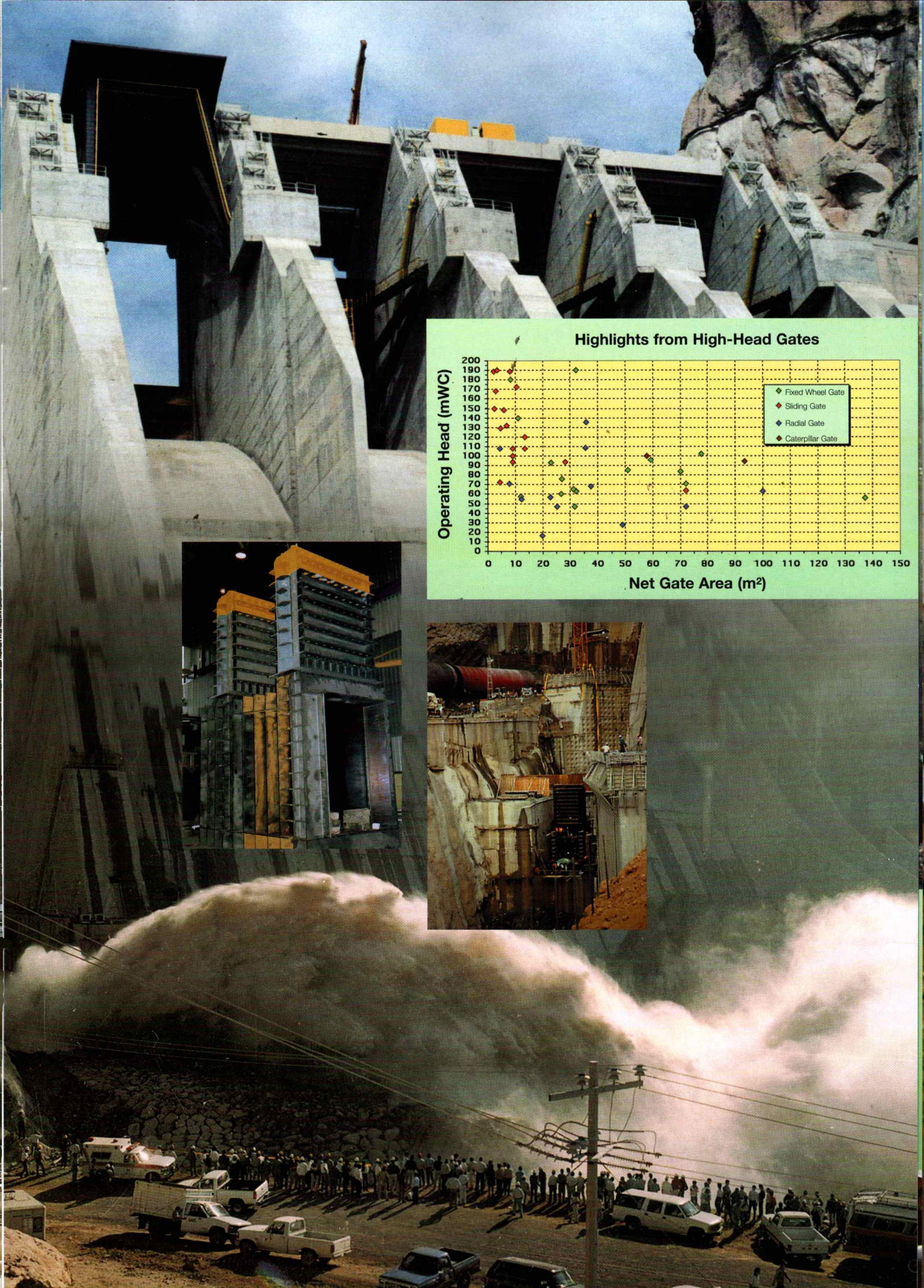
Safety and efficiency are the hallmarks of VA TECH HYDRO's mechanical equipment for dams



Dams for hydropower purpose have to meet extremely stringent safety requirements.
VA TECH HYDRO supplies spillway gates, intake and outlet equipment, as well as bottom outlet and diversion gates, fully conforming to these demands.



The ability of VA TECH HYDRO to take on even the most demanding orders is proved, among others, by our high-head gates; our references in this respect include equipment designed for operating heads of more than 190 mWC.
Numerous orders from the past few years document the international reputation of VA TECH HYDRO as a manufacturer of high-head gates.
Our gates are equipped either with hydraulic (servomotors) or mechanical hoisting devices. Automated circuits and remote-control systems offer safe operation while at the same time limiting operating and personnel costs to a minimum.

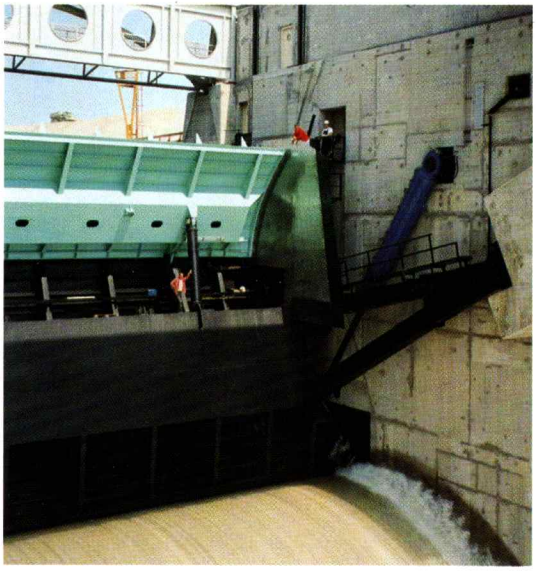

Highlights from High-Head Gates
Operating Head (mWC)
Net Gate Area (m²)
Fixed Wheel Gate
Sliding Gate
Radial Gate
Caterpillar Gate
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200

RUNNING TO PERFECTION

Sophisticated equipment to back up operational safety and easy maintenance of run-of-the-river plants

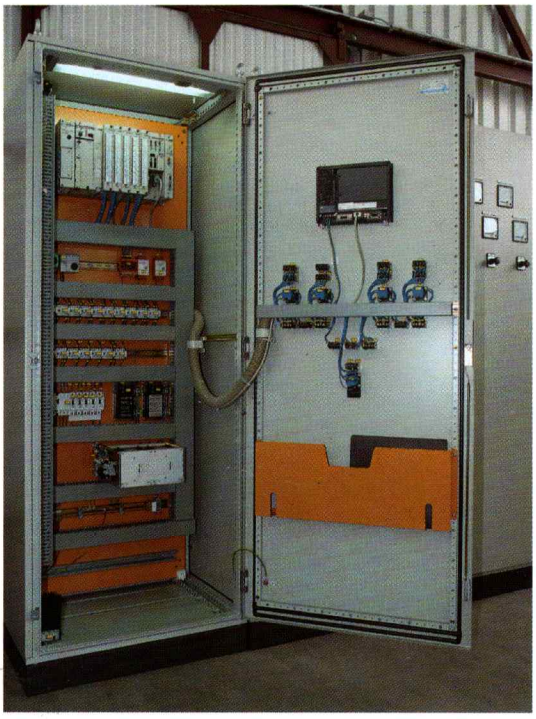
The scope of supply of VA TECH HYDRO includes also components for run-of-the-river plants, such as radial gates with/without flap and double hook gates, intake trashracks, trashrack raking machines, stoplogs and draft tube gates.

Moreover, the programme caters to all requirements of river locks.
Trash racks are designed to embody the optimum hydraulic solution, while minimizing the risk of clogging by floating debris.

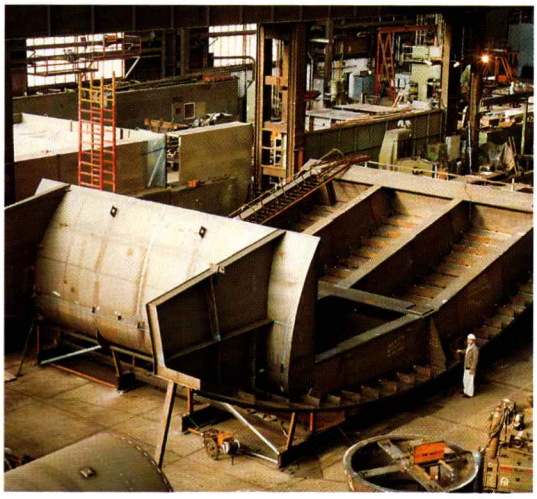


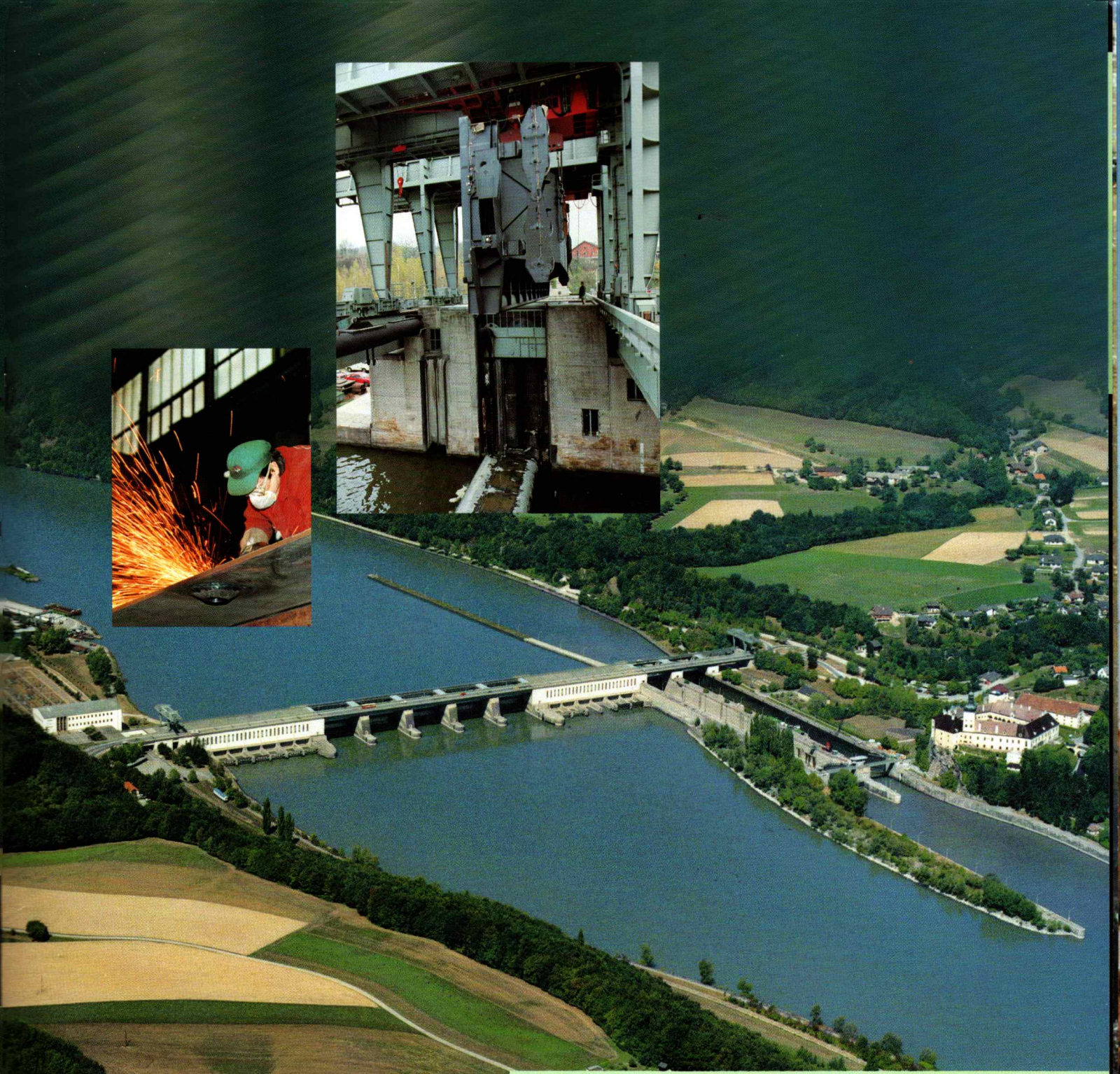
Low-maintenance rack raking machines by VA TECH HYDRO are on standby to avoid any hitch in the running of the plants.

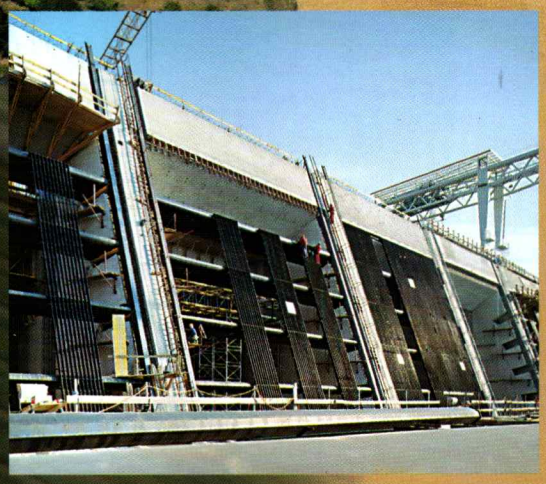
In line with customer wishes, the cranes necessary to move our hydraulic steel structures are also designed and provided by VA TECH HYDRO.

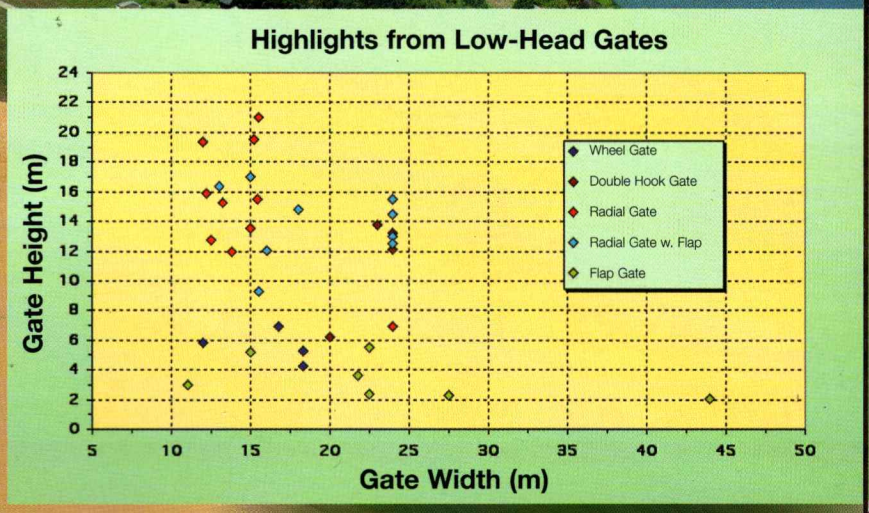


For instrumentation purposes, hardware by internationally renowned manufacturers is used, while the software necessary for operation and control of these installations comes from our own technical offices, and is fully tested by our specialists in the course of commissioning.








Highlights from Low-Head Gates
Gate Height (m)
Gate Width (m)
0
2
4
6
8
10
12
14
16
18
20
22
24
5
10
15
20
25
30
35
40
45
50
Wheel Gate
Double Hook Gate
Radial Gate
Radial Gate w. Flap
Flap Gate

HIGH STANDARDS IN PENSTOCK CONSTRUCTION

13.26 m diameter – 2,070 m head – 6,210 P x D ... characteristic data sure to impress

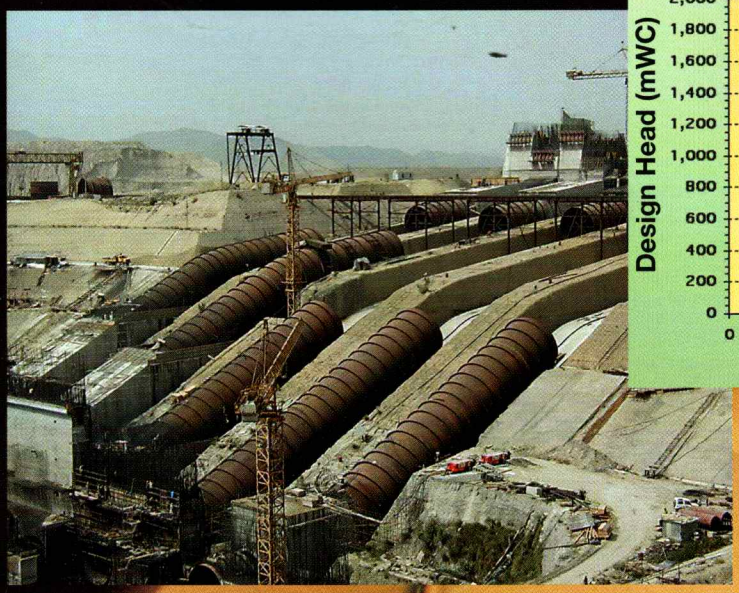
Depending on the actual project setting, we design, manufacture and erect pressure conduits both as exposed and embedded penstocks, as pipe bridges or steel tunnel linings.

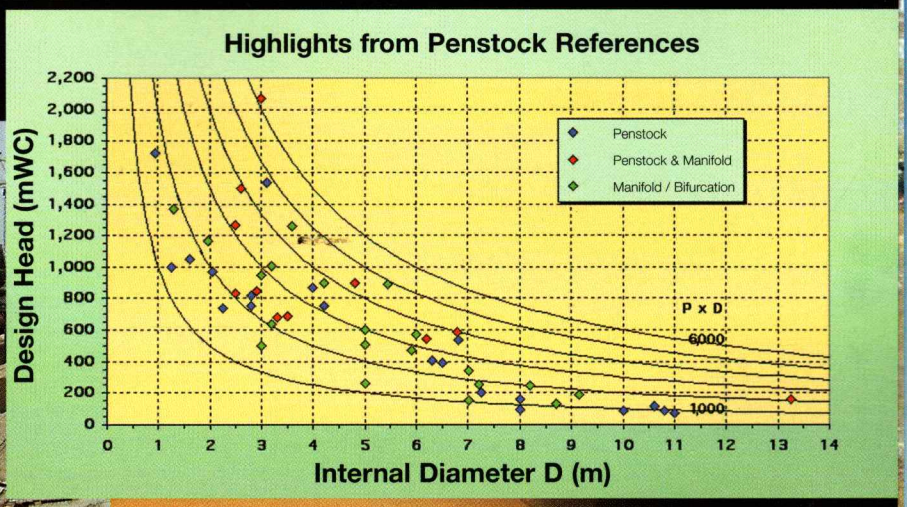
We have also acquired long and competent experience in the design and construction of manifolds and bifurcations. Besides the optimization of hydraulic conditions, the choice of suitable materials is a major concern in penstock construction. The know-how developed in more than 50 years in the production and processing of high-strength steel benefits the engineers at VA TECH HYDRO, and especially in the penstock design department.

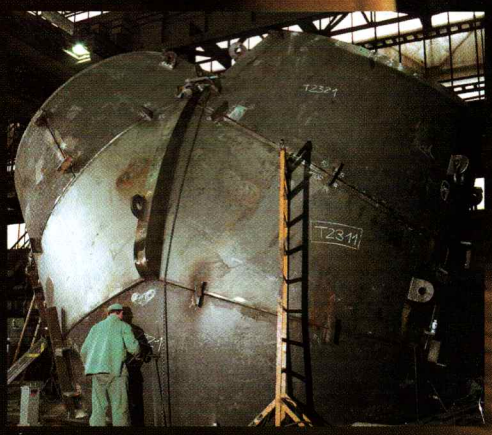
The employment of state-of-the-art and thermomechanically rolled steels as well as quenched and tempered steels enables us to offer our customers attractive solutions.

Many years' experience in the treatment of these materials, combined with the permanent training of our welding staff, guarantee maximum safety in operation.

In penstock construction VA TECH HYDRO can exercise its strength in engineering and project management to full effect. Since more and more penstocks are being manufactured directly at site, professional management under the supervision of VA TECH HYDRO's specialists is gaining increasing importance.




Highlights from Penstock References
Design Head (mWC)
2,200
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14
Internal Diameter D (m)
Penstock
Penstock & Manifold
Manifold / Bifurcation
P x D
6000
1000



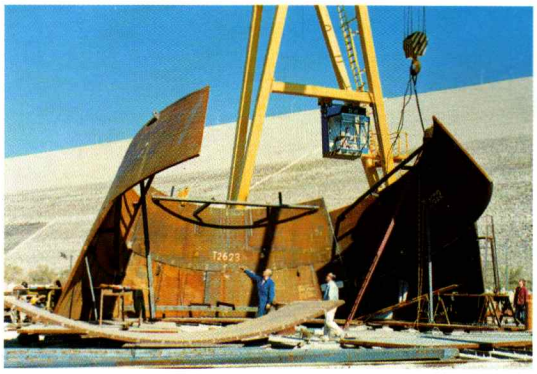
WORLD CLASS IN SITE FABRICATION

Maximum utilization of local resources - under our full responsibilty

The demand of know-how transfer as well as making maximum use of local resources, but also the cost factor, require the increasing outplacement of activities to the project countries.

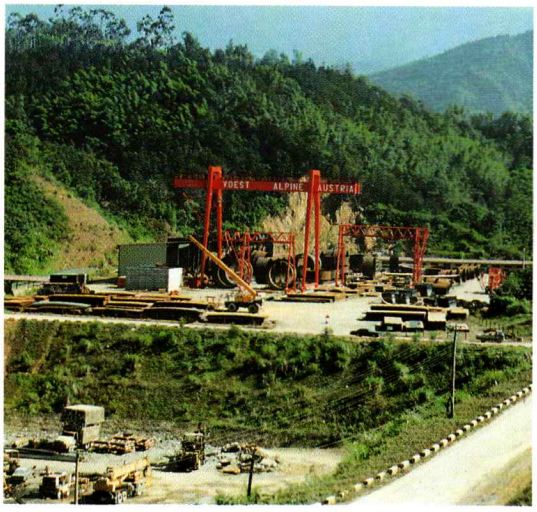
VA TECH HYDRO started to fabricate penstocks directly on site already some 30 years ago. A temporary field workshop is set up to house all the necessary machinery for production and testing, so that deliveries to site are limited to unmachined and flat plates only.

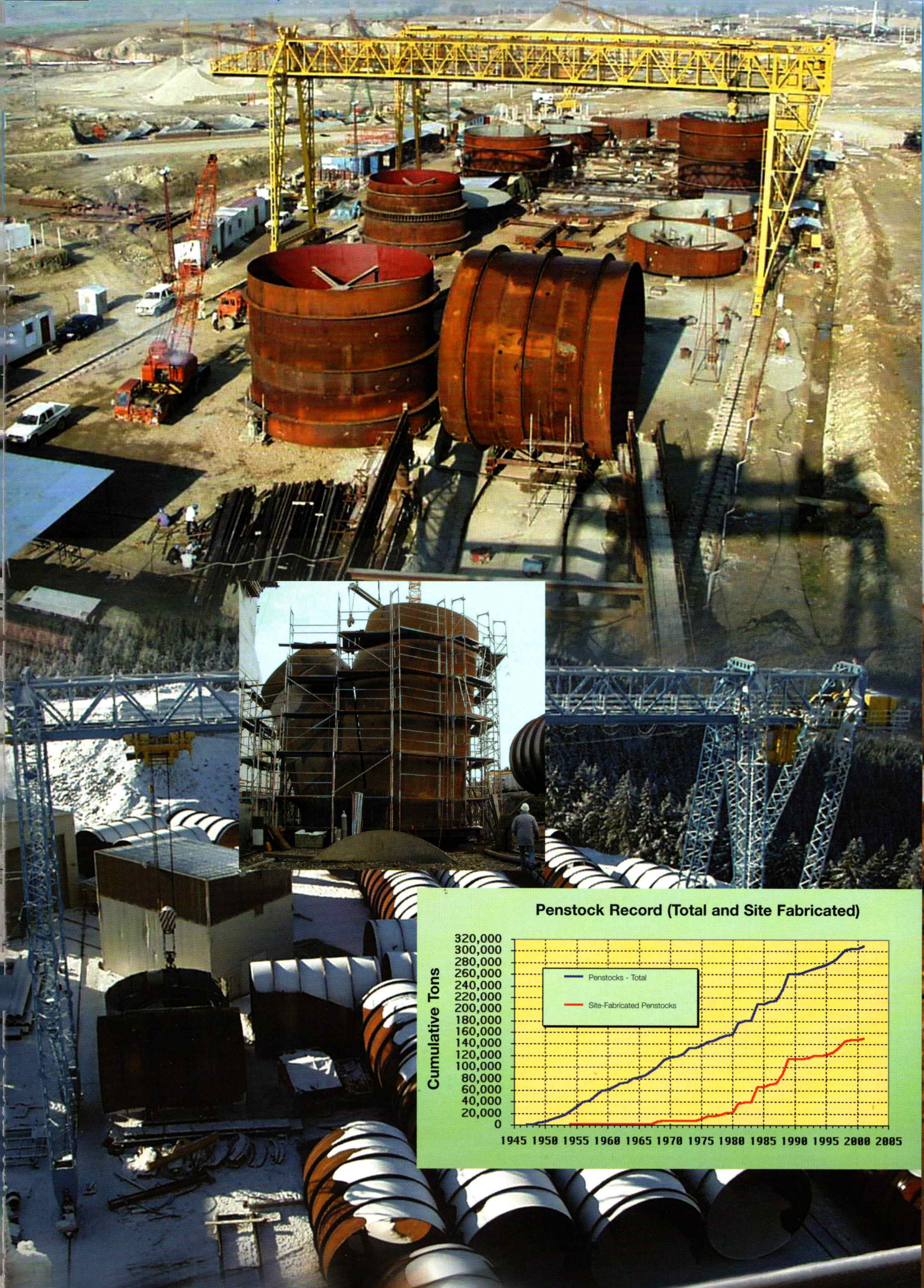
Out of 310,000 tons of penstocks fabricated and erected by VA TECH HYDRO resp. by its predecessor company VA TECH VOEST MCE, some 151,000 tons were fabricated directly on site. So far, site fabrication for 37 contracts have been successfully completed by this technology, in 16 countries under most diverse and adverse conditions of climate and terrain.



The largest project in terms of volume was the Mingtan pumped storage power station in Taiwan, involving 26,000 tonnes of steel conduits and penstocks.
For the 3rd extension of the Tarbela Dam in Pakistan not only the penstocks were fabricated at site, but also, and this was an absolute novelty, the bifurcations - the largest unit having an inlet diameter of no less than 13.26 m and a total weight of 800 tonnes.

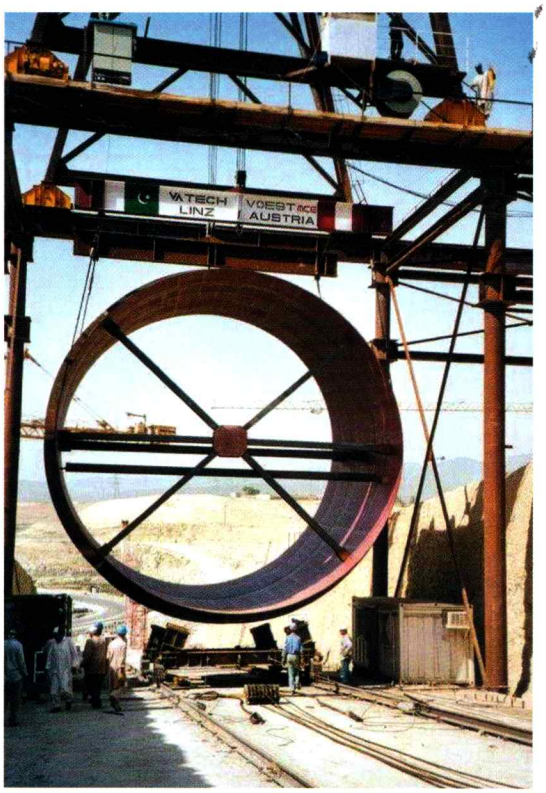
But no matter how large the share of local supplies and services is, the overall responsibility for the project lies with VA TECH HYDRO.




Penstock Record (Total and Site Fabricated)
Cumulative Tons
320,000
300,000
280,000
260,000
240,000
220,000
200,000
180,000
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
0
Penstocks - Total
Site-Fabricated Penstocks
1945 1950 1955 1960 1965 1970 1975 1980 1985 1990 1995 2000 2005

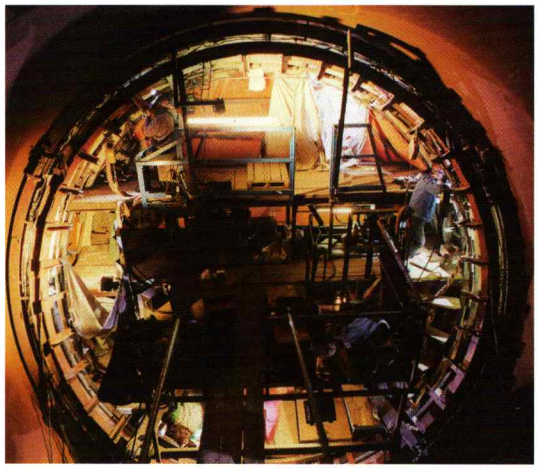
MEETING THE CHALLENGE

First-class equipment takes rough ground in its stride

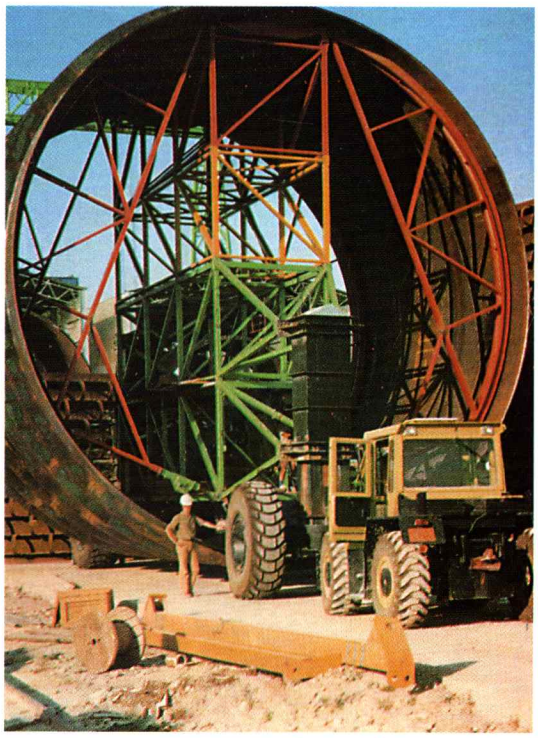


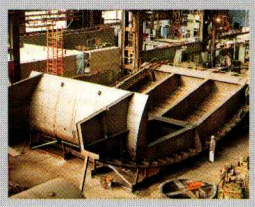
Hydro power plants are often located in areas where access is difficult; handling heavy components provides an additional challenge for erection crews.
Well-considered solutions and special equipment help us to master the even most difficult situations.

Specially developed pipe carriages take large pipes from the field shop to the place of erection.
It copes with units up to 80 tons and even allows access into narrow tunnels.
The heaviest erection units in VA TECH HYDRO history weighed 285 tons, also moved by purpose-built equipment from our own source.

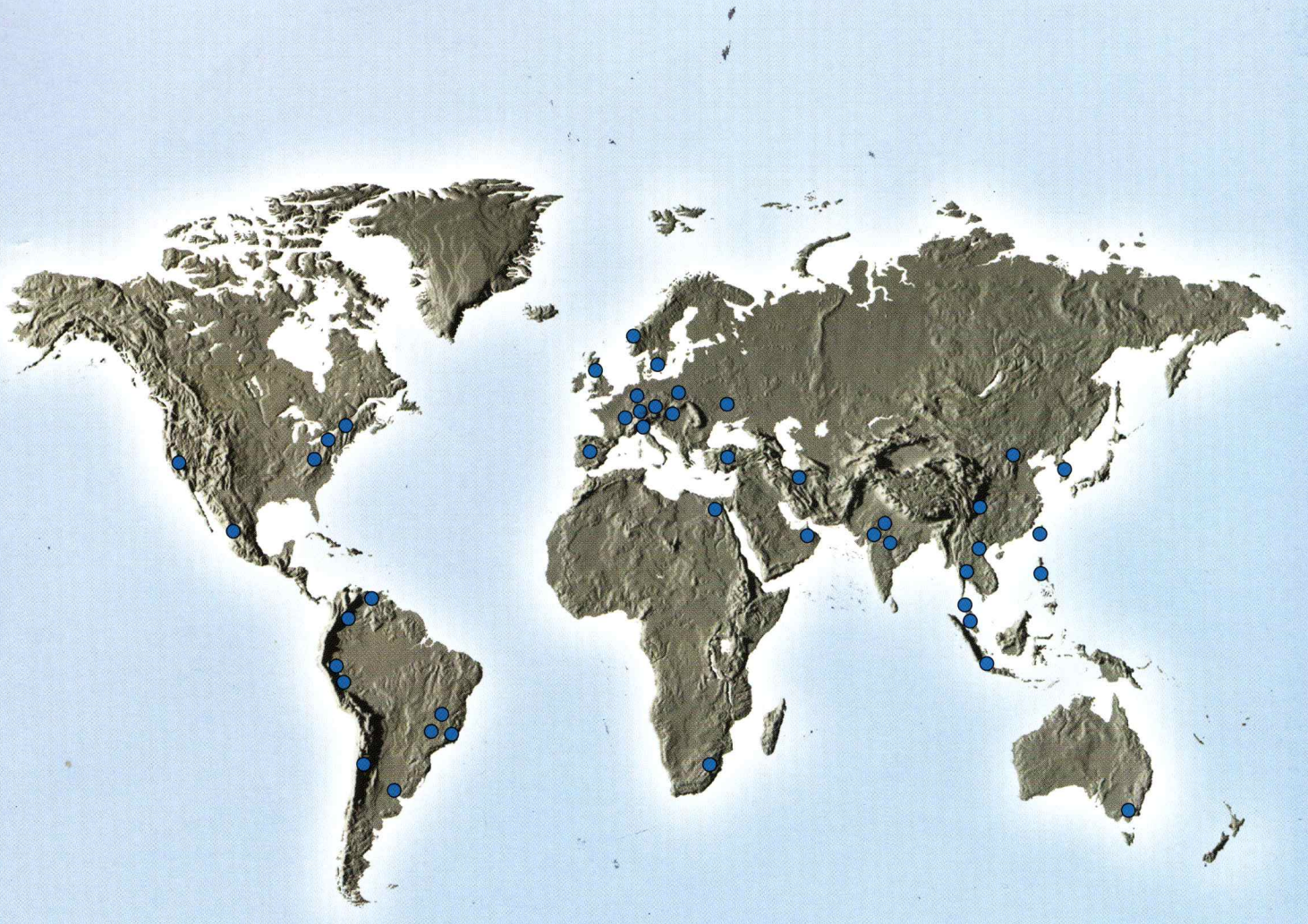


Smaller components, pipes up to 10 tons, are erected with mobile cableway systems, especially in steep mountains or sites in remote areas.
Climbing cranes and temporary erection bridges are also among the not-so-quite-usual methods, all of them perfectly mastered by VA TECH HYDRO.





VA TECH HYDRO worldwide



Set ups in Argentina, Austria, Australia, Brazil, Canada, Chile, China, Columbia, Egypt, France, Germany, Hungary, India, Indonesia, Iran, Italy, Korea, Malaysia, Mexico, Norge, Peru, Philippines, Poland, South-Africa, Spain, Sweden, Switzerland, Taiwan, Thailand, Turkey, United Arab Emirates, United Kingdom, Ukraine, USA, Venezuela and Vietnam.

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